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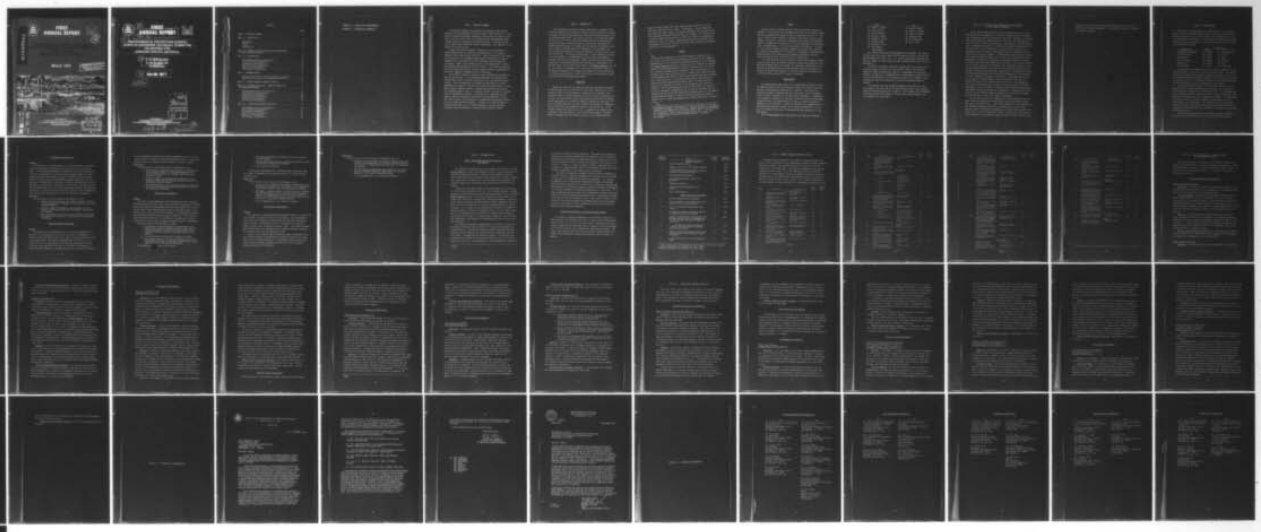

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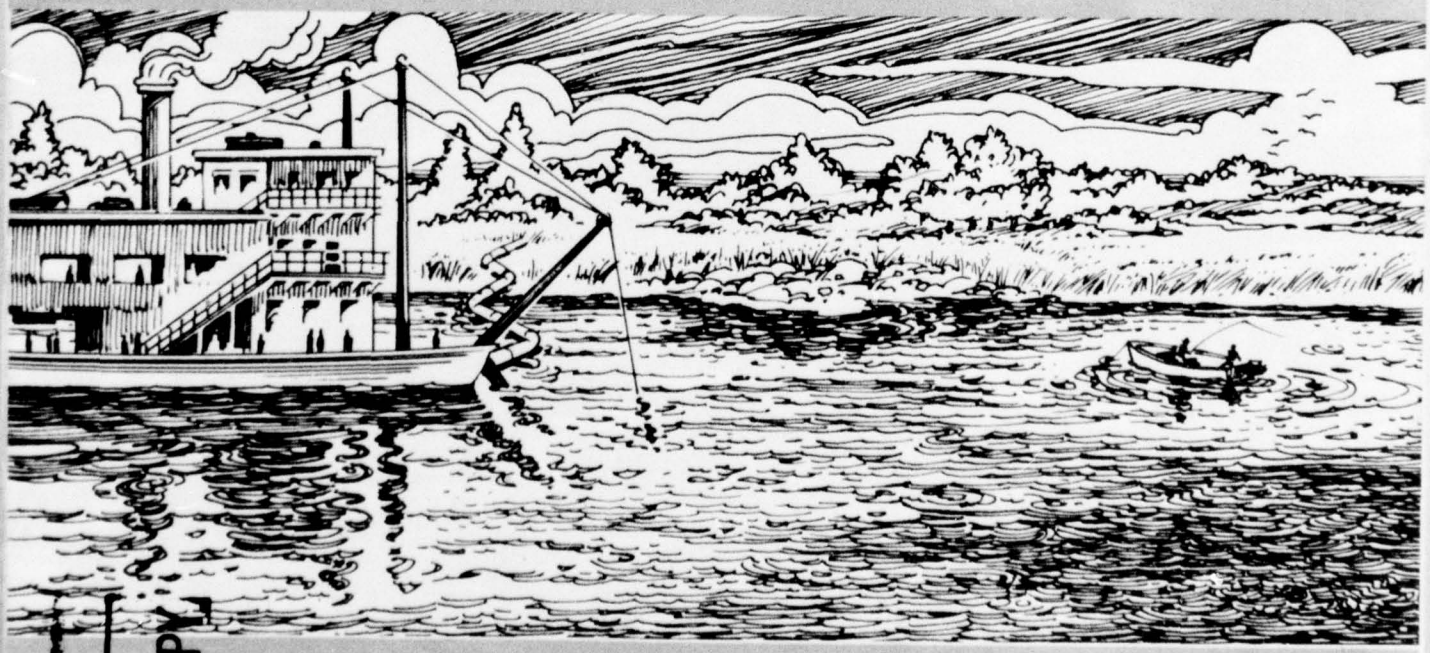
FIRST ANNUAL REPORT

ENVIRONMENTAL PROTECTION AGENCY/ CORPS OF ENGINEERS TECHNICAL COMMITTEE ON CRITERIA FOR DREDGED AND FILL MATERIAL

March 1977



PUBLISHED BY
ENVIRONMENTAL EFFECTS LABORATORY
U. S. ARMY ENGINEER WATERWAYS EXPERIMENT STATION
VICKSBURG, MISSISSIPPI

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(6) ENVIRONMENTAL PROTECTION AGENCY/ CORPS OF ENGINEERS TECHNICAL COMMITTEE ON CRITERIA FOR DREDGED AND FILL MATERIAL.

(10) F. G. Wilkes, EPA
R. M. Engler, CE
Cochairmen

(11) March 1977

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CONTENTS

PART I: EXECUTIVE SUMMARY

A technical committee of scientists and engineers from research elements of the Environmental Protection Agency (EPA) and the U. S. Army Corps of Engineers Waterways Experiment Station (CE) was formed in late 1975 to act as a focal point for coordinating and disseminating agency research related to regulatory functions pursuant to Sections 404 and 103 of Public Laws 92-500 and 92-532, respectively. The committee is co-chaired by the EPA and CE.

A major goal of the Technical Committee is the development of a comprehensive manual for technical implementation of all technical phases of Public Laws 92-500 and 92-532. Other objectives of the Technical Committee are to recommend needed research priorities in order to implement fully Sections 404 and 103, establish joint projects and priorities, conduct joint program reviews, avoid duplication of effort, and exchange and disseminate research results. The Technical Committee will also review and evaluate interim testing procedures promulgated by the CE for immediate implementation by field units.

The Technical Committee consists of six subcommittees cochaired by EPA and CE personnel: the Bioassay/Bioevaluation, Area Definitions, Contaminants, Physical Impacts, Mixing Zone, and Fill Material Subcommittees. These subcommittees will guide the development of interim implementation manuals for Public Laws 92-500 and 92-532 and will recommend research programs designed at generating information that would fill knowledge gaps in order to ultimately develop and publish a comprehensive Implementation Manual. A listing of all related EPA and CE ongoing research programs is presented by each subcommittee in order that there would be no duplication in recommending and assigning priorities for needed research programs. A listing of 16 research areas is presented with each area of research assigned on overall priority; projected costs and duration of study are also presented herein.

PART II: INTRODUCTION

The Environmental Protection Agency (EPA)/Corps of Engineers (CE) Technical Committee on Criteria for Dredged and Fill Material is pleased to present its First Annual Report for the period beginning October 1975 and ending November 1976. The primary activity of the Technical Committee is to act as a focal point for coordinating and disseminating the results from agency research related to criteria and guidelines for regulating the discharge of dredged and fill material as mandated by the Federal Water Pollution Control Act Amendments of 1972 (Public Law (PL) 92-500) and the Marine Protection, Research, and Sanctuaries Act of 1972 (PL 92-532). The major planned product of the committee's activity is the development of an Implementation Manual that will summarize, describe, and define methodologies, sample collection and preservation procedures, calculations, and reference pursuant to implementation of Section 404(b) of PL 92-500 as described in the Federal Register, Vol. 40, No. 173, Friday, 5 September 1975. Other directly related efforts of the Technical Committee will include development (for 1977 publication) of technical procedures for Section 103 criteria of PL 92-532 for inclusion in the overall Implementation Manual.

Background

During the course of the legal and technical negotiations between the EPA and the CE on the Section 404 (PL 92-500) guidelines for evaluating the impact of the discharge of dredged and fill material into navigable waters, it became apparent that the continued development and revision of the technical criteria and guidelines would best be ensured by the appointment of a technical committee charged with this task. It was also deemed desirable that this committee be composed of representatives from both of the responsible agencies, the EPA and CE. It was further evident that there was a need to coordinate the research being conducted at EPA laboratories on the environmental impact of dredged material disposal with the research projects of the Dredged Material

Research Program (DMRP) and other research being conducted at the CE Waterways Experiment Station (WES). Accordingly, it was decided that this committee should consist of research personnel from the appropriate EPA Environmental Research Laboratories and from WES. The committee was officially formed during the fall of 1975 as a result of correspondence between Dr. Wilson K. Talley, Assistant Administrator for Research and Development, EPA, and Mr. William B. Taylor, Chief, Research and Development Office, CE (see Appendix A).

Purpose

The specific purposes of the EPA/CE Technical Committee are to (1) evaluate the Interim Guidance* promulgated by the CE for immediate implementation of the evaluation procedures published in the 5 September 1975 Federal Register pursuant to Section 404 of PL 92-500; (2) develop jointly an interim implementation manual for Section 103 of PL 92-532; (3) coordinate dredged material ecological research activities (i.e., establish joint projects and priorities, conduct joint program reviews, avoid unplanned duplication of effort, and exchange and jointly disseminate research results); (4) mutually develop both a short-term and a long-term methods Implementation Manual; and (5) provide technical guidance for subsequent revisions of the guidelines and criteria as required. The interim manuals discussed in this report are those required for immediate implementation of the various technical parts of Sections 103 and 404 and the Implementation Manual refers to the comprehensive guidance manual for Sections 103 and 404 that will require several (2 to 3) years developmental and research time prior to publication.

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* Environmental Effects Laboratory, "Ecological Evaluation of Proposed Discharge of Dredged or Fill Material. Interim Guidance for Implementation of Section 404(b)(1) of PL 92-500 (Federal Water Pollution Control Act Amendments of 1972)," Miscellaneous Paper D-76-17, June 1976, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Scope

Section 404 of PL 92-500 specifies that any proposed discharge of dredged or fill material into navigable waters must be evaluated through the use of guidelines developed by EPA in conjunction with the CE. The scope of the Technical Committee includes all pertinent research, past, present, and future, conducted to determine the potential environmental impact of dredged and fill material and on the development and modification of methodologies to predict and determine such impacts. The scope of the Technical Committee further includes the assembly and synthesis of technical information for the purpose of developing an Implementation Manual suitable for conducting the evaluation mandated by both Sections 404 and 103 of PL 92-500 and 92-532, respectively.

It should be noted that as a result of recent environmental legislation and court cases concerning regulatory criteria and guidelines, the EPA and CE mandate must now consider the pollutional properties of fill material originating from other than dredging activities and must interpret the term "water quality" to mean more than water chemistry and to include "water resource" or "aquatic ecosystem."

Organization

The organizational approach used in establishing the EPA/CE Technical Committee was to form an interagency committee to review, interpret, and make recommendations regarding all activities. This group was termed the Technical Committee and was constituted to make recommendations to and be responsible to top-level agency management. Membership of the Technical Committee was limited to staff who have broad knowledge, responsibilities, and understanding of needs for research programs in dredge and fill activities. It was also agreed that a representative of the EPA Regions would be included on the Technical Committee on a one-year trial basis in the role of representative and coordinator for all EPA regions.

The following members were appointed by the respective agencies:

EPA	CE
Dr. Frank G. Wilkes	Dr. John W. Keeley
Dr. Paul Lefcourt	Dr. Robert M. Engler
Dr. William Brungs	Dr. Roger T. Saucier
Dr. Harold V. Kibby	Dr. John Harrison
Dr. Michael D. Mullin	Mr. M. Burton Boyd
Dr. Donald Phelps	Dr. Rex L. Eley
Mr. William S. Davis	
Dr. Rich Ronan*	

*EPA Region V

Drs. Wilkes and Keeley were designated as cochairmen. Drs. Keeley and Eley have since been replaced on the committee by Drs. Pat Hunt and Richard Peddicord, respectively. Dr. Engler has assumed cochairmanship with Dr. Wilkes. Dr. Ronan has since been replaced by Dr. Mark Carter of EPA Region V.

To conduct the various technical programs under its purview and to accomplish goals of narrow scope and specific detail, the Technical Committee formed subcommittees, each to be responsible for providing methods, procedures, or recommendations for modifying the guidelines and criteria, as applicable to its particular aspect of the problem. Each subcommittee was to be cochaired by EPA and CE Technical Committee members.

It was agreed that the Technical Committee should meet at least three times a year with EPA and CE alternating as hosts. Four meetings have been held during the past 14 months: 16-17 October 1975 (Vicksburg), 29-30 January 1976 (Gulf Breeze), 8-9 July 1976 (San Francisco), and 3-4 November 1976 (Las Vegas).

PART III: PERSPECTIVE AND EVALUATION OF EFFECTIVENESS OF THE TECHNICAL COMMITTEE

Public Laws 92-500 and 92-532 clearly identified the roles of the EPA and the CE in management of the Nation's aquatic resources through their respective permit and regulatory activities. However, the existing state-of-knowledge for implementation of these laws was inadequate for truly effective criteria and guidelines. Consequently, it became obvious that a mechanism was needed to coordinate the research activities of the EPA and the CE so that duplication of effort did not occur and that significant areas of research requirements were not inadvertently neglected in the research programs. A mechanism was also needed to disseminate research findings rapidly to the field via procedures manuals and guidelines to ensure that regulatory decisions were made on as sound a scientific and engineering foundation as possible. Sections 404 and 103 of the respective Public Laws describe only in general ecological terms the procedures that must be followed in evaluating the effects of discharge of dredged or fill material; consequently, a mechanism was needed to effectively promulgate more definitive procedures for field elements to use in making the ecological evaluations. Considering that many of the ecological concerns require technical procedures that are at or exceed the limits of the current state-of-the-art, it was recognized that a research protocol was necessary to supply the field the needed procedures in a timely fashion. Therefore, the respective research and development offices of the EPA and CE (Appendix A) authorized the formation of the ad hoc EPA/CE Technical Committee on Criteria for Dredged and Fill Material to meet these urgent requirements.

The effectiveness of this committee can be best judged by the program coordination described in this Annual Report and by the research priorities described herein. Other direct measures of effectiveness are the workshops sponsored through the subcommittees to pursue highly specific goals for individual requirements of Section 404 and 103 of the Public Laws. Of equal importance, however, has been the significantly increased level of communication among CE and EPA research elements and

field units. This increased communication should lead to a more effective and efficient management of each agency's respective regulatory and research programs.

PART IV: SUBCOMMITTEES

The concept of designating ad hoc subcommittees on an as-needed basis to aid in addressing priority problem areas was approved by the Technical Committee at its first meeting. The subcommittees are to be cochaired by EPA and CE members of the Technical Committee and staffed by EPA/CE technical personnel. The designated subcommittees are listed and cochaired as follows:

	Cochairmen	
Subcommittee	EPA	CE
Bioassay/Bioevaluation	Dr. Phelps	Dr. Eley/Peddicord
Area Definitions	Dr. Kibby	Dr. Saucier
Contaminants	Dr. Mullin	Dr. Engler
Physical Impacts	Dr. Wilkes	Dr. Harrison
Mixing Zone	Dr. Brungs	Mr. Boyd
Fill Material	Mr. Davis	Dr. Keeley/Hunt

It was agreed that subcommittees could call on consultants or non-agency personnel to aid them in specific technical areas. The problem areas and the appropriate Technical Committee function(s) to which they are addressed and the designated cochairmen are presented and discussed in subsequent sections. A complete listing of the subcommittee members and their addresses is given in Appendix B of this report.

In the developmental stages of the Technical Committee, it was decided that the various subcommittees would guide the development of the Implementation Manual for PL 92-500 and 92-532. The subcommittees would recommend research programs designed to generate information that would fill knowledge gaps in the Implementation Manual. The Implementation Manual would be revised or expanded as appropriate using this information as it is generated. The subcommittee research programs would be directed toward developing methods for determining needed information rather than generating information applicable to all dredge and fill operations.

It was further decided that the subcommittees would establish a priority for each task after which the Technical Committee would

integrate the tasks into a master priority list. Each subcommittee would set priorities according to the following criteria:

- Bottom sediment impacts are more important than water column impacts.
- Influence of time is of prime importance (i.e., what will the nature, degree, and extent of the impact be over time?).
- The user of this information will have to answer the following general questions:

  Will there be an effect?
  How significant will the effect be?
  How can significant adverse impacts be minimized?

Bioassay/Bioevaluation Subcommittee

Purpose

This subcommittee will recommend, develop, and evaluate bioassay techniques to be used in the evaluation of applications for dredged and fill material disposal regulatory permits. Complementary laboratory and field research will be conducted in order to refine the bioassay techniques, relate them more closely to field conditions, and improve the interpretive guidance for making extrapolative predictions of field effects from the laboratory results. Methods for conducting field surveys for predisposal site evaluation and postdisposal monitoring will be tailored to dredged and fill material.

The Bioassay/Bioevaluation Subcommittee will rely on the Physical Impacts Subcommittee to outline information needed to determine the area likely to be impacted and the physical conditions of that impact. The Contaminants Subcommittee will provide input on methods to determine the presence, concentration, and chemical nature of contaminants in the material. Using this information, the Bioassay Subcommittee will provide a program outline to develop appropriately sensitive and implementable evaluative techniques. The results of these evaluations must be interpreted in light of the mixing and dilution guidance from the Mixing Zone Subcommittee in order to make useful estimates of potential field effects. Guidance will be provided to the regulatory personnel on

(1) the applicability of various bioassay techniques to particular situations; (2) strengths and limitations of the various techniques; and (3) factors to be considered in interpreting the results and estimating the potential for effects in the field.

Objectives

The objectives of the Bioassay Subcommittee include:

1. Providing District Engineers and Regional Administrators with bioassay methods and factors to consider when selecting them (for Implementation Manual).
2. Identification of research requirements and priorities for the purpose of developing additional bioassay methods.
3. Ensuring that bioassay testing procedures developed by the respective agencies meet the regulatory mandates of PL 92-500 and 92-532 while remaining implementable on a regional basis.
4. Acting as a technical review panel for bioassessments developed by the respective agencies and making recommendations to the Technical Committee concerning such procedures.

Area Definitions Subcommittee

Purpose

The purpose of this subcommittee is to consider definitions and aspects of jurisdiction for Section 404 of PL 92-500, with emphasis on wetlands boundaries. Coordination with other agencies doing similar work will be required. For example, the U. S. Fish and Wildlife Service will soon publish a classification of wetlands.

Objectives

The objectives of the Area Definitions Subcommittee are to:

1. Prepare a state-of-the-art description of wetland types with explanation of how District Engineers can relate this information to requirements of Section 404 of PL 92-500.
2. Identification of research requirements to develop needed information concerning wetlands and vegetative definitions for the Implementation Manual.
3. Make recommendations to the Technical Committee concerning the overall wetlands evaluation program and discuss interrelationships with other Federal programs.

Contaminants Subcommittee

Purpose

The purpose of this subcommittee is to provide methods for characterizing contaminants in dredged and fill material used in bioassay tests. The Bioassay/Bioevaluation Subcommittee will provide methods of using this information in conjunction with bioassay results to predict potential harmful environmental impacts of dredged and fill material. Emphasis will be placed on dredged/fill materials after they have been deposited. Methods will be provided for initial characterization of the materials, fractionation of the sample into different available subsets, and the determination of toxic metals, persistent organics, and petroleum hydrocarbons in the sample and its several fractions. This subcommittee will also provide chemical tests to the Fill Material Subcommittee.

Objectives

The objectives of the Contaminants Subcommittee are to:

1. Provide District Engineers with chemical methods to characterize contaminants in dredged and fill material (for Implementation Manual).
2. Identify research requirements and priorities for the purpose of developing additional contaminant characterization methods.
3. Make recommendations to the Technical Committee concerning procedures to be included in or revised in the Implementation Manual.

Physical Impacts Subcommittee

Purpose

The purpose of this subcommittee is to provide recommendations of methods for evaluating the direct physical impacts of disposing of dredged and fill material in open water (water column and bottom effects) or on upland areas. The impacts considered will include but not be limited to those on circulation, stratification, temperature distribution, and light penetration, as well as the impact of smothering of bottom-dwelling organisms. The application of the procedures developed

by this recommended research will provide information for use in conjunction with the results of bioassay/bioevaluation tests to assess the potential impact of dredged and fill material on aquatic systems.

Objectives

The objectives of the Physical Impact Subcommittee are to:

1. Provide District Engineers with methods for assessing the direct physical impact of disposing dredged and fill material and the factors to consider when selecting a particular method.
2. Identify research requirements and priorities for the purpose of improving and applying available methods for determining physical impacts.
3. Make recommendations to the Technical Committee concerning procedures for evaluating physical impacts to be used in the Implementation Manual.

Mixing Zone Subcommittee

Purpose

The work of this subcommittee may be divided into two categories: biological and engineering. The current EPA and CE programs will provide models and methods for determining the surface and bottom area covered and the water column characteristics based on different disposal techniques, rates, and current and flow patterns. The engineering approach would thus provide the plume size, surface area, etc. The biological approach would develop a set of guidelines to determine how large an affected area can be without exceeding acceptable levels of degradation.

Important points to be considered include:

1. As exposures in the mixing zone are intermittent and short-lived in nature, adjustments must be made when relating water-quality criteria to the EPA Water Quality Criteria, which are based on continuous low-level exposures.
2. Are water quality criteria met at mixing zone edge?
3. Even though transient, the bottom exposures may be more significant than those in the water column because of the short duration of the disposal operation.

The Mixing Zone Subcommittee will provide:

1. Biological guidelines to determine how much of an area can be degraded.
2. Engineering methods (models) to determine how much of that area would be committed for disposal.
3. Site selection guidelines.

The Bioassay Subcommittee will provide methods to determine what the impact of dredged and fill material will be if it falls within a specified area.

Objectives

The objectives of the Mixing Zone Subcommittee are to:

1. Provide District Engineers and Regional Administrators with guidelines to determine the acceptable area of degradation and possible disposal areas (for Implementation Manual).
2. Recommend a research program to develop improved techniques for estimating mixing zones resulting from the open-water disposal of dredged material, with particular emphasis given to the relationship between the mixing zone, the disposal site, and proposed bioassay methods.
3. Make recommendations to the Technical Committee.

Fill Material Subcommittee

Purpose

Fill material, as distinguished from dredged material in Section 404 of PL 92-500, is material used to raise elevation. This subcommittee will focus on the problem of leaching from fill material deposited in aquatic systems. The approach will be to categorize fill material types, release sites, and impact assessment tests. The research planned and coordinated by this subcommittee will emphasize adapting existing test methods rather than developing new tests.

Input will be obtained from the Physical Impacts Subcommittee that will provide methods for determining the physical impact of fill material as well as dredged material. The Contaminants Subcommittee will supply the Fill Material Subcommittee with tests for the chemical characterization of fill material.

Objectives

The objectives of the Fill Material Subcommittee are to:

1. Provide District Engineers and Regional Administrators with methods of assessing impact of leaching from fill material and factors to consider when selecting them (for Implementation Manual).
2. Identify research requirements and priorities for the purpose of developing additional applications of available methods to fill material leaching problems.
3. Make recommendations to the Technical Committee.

PART V: RECOMMENDATIONS

Public Laws 92-500 and 92-532 Guidelines and Criteria

The guidelines promulgated in the 5 September 1975 and 28 June 1976 Federal Register require that judgments be made on the potential harm of individual disposal operations. Based on these judgments, disposal permit applications will be either issued, modified, or denied. Comparable, reproducible, and definitive field and laboratory procedures are needed to ensure that technically sound evaluations and decisions are reached.

In May 1976 an Interim Guidance for implementation of Section 404 of PL 92-500 was published by the CE.* This document presents a general sequence of testing and evaluative procedures described in the 5 September Federal Register as well as detailed procedures for conducting an elutriate test, estimating a mixing zone, performing bioassays, conducting total sediment analyses, and evaluating biological community structure. While the Interim Guidance is as specific as possible based on current knowledge, it is evident that much additional information is needed to upgrade, expand, or replace the described tests. It is further evident that new methodologies must be developed to augment those available, particularly with respect to bioassay tests, analytical tests for sediment composition, and methods for determining the effects of fill material discharge.

The Technical Committee recommends that top priority be given to developing information and procedures for revising and upgrading the Interim Guidance. Methods for conducting benthic bioassays should be emphasized as the benthos will receive the most significant and long-term impact of dredged and fill material disposal. Methodologies for determining the relative value of wetland and water areas is a fundamental need for use in decisionmaking on the environmental acceptability

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* Ibid.

of proposed dredging and fill activities. The sampling and analytical portions of the Interim Guidance must be improved in scope and detail. Methodologies quantifying the significant physical impacts must be more fully developed in order to increase the specificity and utility of the criteria. Finally, as there are several orders of magnitude more information on dredged material than on fill material originating on land, procedures applicable to fill material must be devised.

The Technical Committee recommends that the Interim Guidance furnished by the CE for interim implementation of Section 404 of PL 92-500 be used until the Implementation Manual is developed. It is further recommended that as newer and more meaningful bioassay and sediment characterization procedures are released by the respective subcommittees and approved by the Technical Committee, they be published as Appendixes to the Interim Guidance for immediate dissemination to the field. It is then recommended that the broadly based Implementation Manual completely replace the Interim Guidance when published and be comprehensive enough to be used for both PL 92-500 and 92-532. With regard to Section 103 of PL 92-532, the Technical Committee recommends that an Interim Guidance as done for Section 404 also be published by the CE after review and approval by the Technical Committee.

Research Priorities for the Implementation Manual

The research programs recommended by the Technical Committee for implementation of PL 92-500 and 92-532 are shown in the following tabulation in order of priority. The items listed as immediate priorities include information and procedures that are needed to revise and upgrade the CE Interim Guidance and to develop the Implementation Manual. The longer term research priorities include research programs needed for a complete understanding of ecological perturbation and mitigation of impacts.

Order of Priority	Title	Duration Years	Resource Needs, $K*
	Immediate Priorities		
1	Benthic Organism Bioassay	2	None
2	Sampling, Analytical, and Interpretive Manual	2	500**
3	Wetlands Vegetation Identification Guide and Transition Zone Characterization	2	None
4	Improved Mixing Zone Guidance	2	None
5	Fill Material Assessment: Types and Quantities	1	None
6	Headwaters Definition	1	None
7	Survey of Present Methodologies (Fill Material)	1	100**
8	Water Column Bioassay	2	None
	Longer Term Research Priorities		
1	Benthic Organism Bioassay Development	3	1300
2	Predictive Models for Determining Short-Term Physical Fate of Disposed Materials	2	None
3	Short- and Long-Term Sediment/Water Interactions	5	875**
4	Procedures to Evaluate and Quantify Mobility of Contaminants from Fill Material	1	100
5	Methods to Predict Material Distribution from Wetlands Fill and Effects of Topography and Elevation Changes on Wetlands Drainage and Circulation	4	1000
6	Evaluation and Field Verification of State-of-the-Art Predictive Models of Sediment Dispersion and Transport	2	300
7	Methods to Predict How Changing Bottom Topography and Depth from Fill Operations Alter Circulation	6	1300
8	A Final Decision Tree for the Implementation Manual	1	200

* Where resource needs are indicated as "none," research programs are currently funded or programmed for initiation with FY 77 funds.

** Partial funding has been allocated to initiate work.

PART VI: CURRENT RESEARCH PROGRAMS (CE/EPA)

Ongoing research programs of the respective agencies related directly to the development of the Implementation Manual have been compiled and are presented in the following tabulation according to related subcommittee functional areas. The ongoing programs and those nearing completion address almost all of the immediate research priorities presented in the preceeding sections and emphasis should be placed on coordination of the research with rapid dissemination of the results to EPA and CE field offices. Refer to Part V for a further evaluation of the relationship of ongoing research and recommended research priorities.

Agency	Project Title	Investigating Group	Total Funding $K	Project Completion FY
		Bioassay/Bioevaluation		
CE	Development of bioassay methodologies using selected benthic organisms	Environmental Effects Laboratory, WES	270	77
CE	Biological assessment of the elutriate test	Environmental Effects Laboratory, WES	297	76
CE	Development of a time-dilution bioassay technique appropriate to dredged material	Stanford Research Institute	99	77
CE	Vertical migration ability of benthos in dredged material deposits	University of Delaware	127	77
CE	Availability of sediment-sorbed metals to benthos	Texas A&M University	101	77
CE	Availability of sediment-sorbed pesticides to benthos	LFE Environmental Analyses Laboratory	106	76
CE	Response of aquatic animals to suspended dredged material	University of California, Bodega Marine Laboratory	197	77
CE	Uptake of oil and grease from dredged material	Naval Biomedical Research Laboratory	72	77
CE	Benthic recolonization of dredge and disposal sites	San Jose State University	107	77
EPA	Development of Multispecies Benthic Bioassay for Toxicity of Dredged Material Proposed for Marine Disposal	EPA in conjunction with the New England Aquarium	80	78
EPA/CE	Release and Bioavailability of Pollutants from Dredge Spoils Discharge of Coastal Waters	Corvallis Environmental Research Laboratory University of Washington	40/200	77
EPA	Multispecies Benthic Bioassay for Dredge Spoils	Corvallis Laboratory	170	78
EPA	Development of a Bioassay Procedure for Estimating the Impact of Dredged Material on Estuarine and Marine Environments	Gulf Breeze Laboratory	150	78

(Continued)

Agency	Project Title	Investigating Group	Total Funding $K	Project Completion FY
EPA	Development of Ecosystem Models of Benthic Environments for Use in Predicting the Impact of Dredged Material Disposal on Estuarine and Marine Benthic Communities	VIMS	500	81
EPA	Development of Bioassay Procedures for Pollution of Harbor Sediments	University of Wisconsin	198	78
		Area Definitions		
CE	Development of Regional Wetland Vegetation Identification Guides	WES		
	A. Alaska	Dr. David Murray Fairbanks, AK	35	77
	B. West Coast	Dr. Thomas Harvey Santa Clara, CA	30	77
	C. Interior-Great Lakes	Mr. Gerould Wilhelm Lilse, IL	25	77
	D. Florida	Dr. Howard Teas Miami, FL	36	77
	E. Puerto Rico	Dr. Howard Teas Miami, FL	38	77
	F. Gulf Coast	WES	30	77
	G. Synthesis and Review	Dr. Richard Daley	86	77
CE	Regional Wetlands Identification and Delineation, and Development of Detection and Monitoring Procedures and Systems	Several CE Districts and Laboratories	> 500	Variable
CE	Preparation of Technical Wetlands Manual and Methodology for Wetlands Evaluation	USAE Institute for Water Resources	100	77
EPA	Development of Vegetative Criteria for Wetland Upper Boundary Determinations	Corvallis Environmental Research Laboratory		
	A. Pacific Northwest	Oregon State University	46	
	B. California	San Jose State University	52	
	C. Alaska	University of Alaska	80	
	D. Interior-Great Lakes	Winona State University	33	
	E. South Atlantic	Virginia Institute of Marine Science	36	
	F.	National Ocean Survey	85	
EPA	Vegetative Criteria for Wetlands	Corvallis Laboratory	400	77
		Contaminants		
EPA	Future Dredging Quantities on the Great Lakes (Grant)	Eastern Michigan University	27	75
EPA	Water Quality Reports of Sediment Dredging in Large Lakes Systems (Grant)	University of Michigan	236	76
EPA	Uptake and Release of Hazardous Substances by Suspended Materials and Sediments in Lakes	University of North Carolina	197	79
EPA	Sediment-Water Exchange Model	Manhattan College	300	80
EPA	Survey of Nutrients and Hazardous Substances in Saginaw Bay, Michigan	Cranbrook Institute of Science	409.9	79
EPA	Rate of Accumulation of Potentially Hazardous Substance in Recent Sediments in Lake Huron	University of Michigan	110	77

(Continued)

Agency	Project Title	Investigating Group	Total Funding $K	Project Completion FY
CE	Direct and Indirect Effects of Sediment Organic Fractions on the Mobilization and Immobilization of Various Contaminants During Dredging and Disposal of Sediments	Cold Regions Research and Engineering Laboratory	126	76
CE	Study of Mobilization and Immobilization of Pesticide and PCB Materials into Water Column During Dredging and Disposal	Envirex, Inc.	102	76
CE	Study of Eh, pH, and DO Effects on Chemical Constituent Migration During Open-Water Disposal of Dredged Material	Agronomy Department Louisiana State University	91	77
CE	Effect of Dispersion, Settling, and Resedimentation on Migration of Chemical Constituents During Open-Water Disposal of Dredged Material	Dept. of Environmental Engineering University of Southern California, Los Angeles	97	76
CE	Development of Dredged Material Disposal Criteria	Texas A&M University (Subcontract to Univ. of Texas at Dallas)	133	75
CE	Refinement of Current Disposal Criteria, Identification of Subject Areas for Further Development, and Refinement of Bioassay Procedures for Disposal Criteria	University of Texas at Dallas	143	77
CE	Investigation of Partitioning of Various Elements in Dredged Material	Environmental Effects Laboratory, WES	312	76
CE	Long-Term Release of Contaminants from Dredged Material	Environmental Effects Laboratory, WES	100	77
CE	Physical and Chemical Characterization of Contaminated Dredged Material Influents, Effluents, and Sediments in Confined Upland Disposal Areas	Environmental Effects Laboratory, WES	134	77
CE	Study of Leachate from Dredged Material in Upland Disposal Sites and/or in Productive Uses	SCS Engineers, Long Beach, CA	129	77
CE/EPA	Physical and Chemical Monitoring of River Sediments and Water and Confined Disposal Area Dredged Material Influents, Effluents, and Sediments During High-Solids Dredging of a PCB Spill	Environmental Protection Agency, Region X, and Seattle District, CE	17/9	77
CE	Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions	University of Southern California, Los Angeles	30	77
CE	Physical and Chemical Characterization of Dredged Material Sediments and Leachates in Confined Land Disposal Areas	SCS Engineers	154	77
CE	Dredged Material Research Program Aquatic Disposal Field Investigations	Contract and in-house WES	5000 6000	77
		Physical Impact		
CE	Dredged Material Research Program Field Studies	Various contractors	6000	78
CE	Dredged Material Research Program Task 1B and 6C studies related to Movements of Dredged Material	Various contractors and in-house WES	1000	78

(Continued)

Agency	Project Title	Investigating Group	Total Funding $K	Project Completion FY
CE	Assessment of Aesthetic and Ecological Significance of Turbidity in Various Aquatic Environments	Living Marine Resources, Inc.	46	77
CE	Determination of the Vertical Migration Ability of Benthos in Dredged Material Deposits	University of Delaware	127	77
CE	Response of Selected Aquatic Organisms to Suspended Dredged Material	Bodega Bay Marine Institute	167	77
CE	Dredged Material Research Program Various Habitat Development Studies	Various contractors and in-house WES	3000	78
		Mixing Zone		
CE	Participation in Field Verification of Tetra Tech Models for Predicting Short-Term Physical Fate of Dredged Material	Hydraulics Laboratory, WES	60	77
CE	Physical Characteristics of Dredged Material and the Effects of Dispersion Behavior During Open-Water Disposal Operations	Yale University	208	77
CE	Nature, Degree, and Extent of Turbidity Generated by Open-Water Pipeline Disposal Operations	State University of NY	193	77
CE	Fluid Mud Dredged Material: Its Physical Nature and Dispersion	Virginia Institute of Marine Science	146	77
CE	Acoustical Study of Dredged Material Discharged in the Coastal Environment	Sea-Air Interaction Laboratory NOAA	21.5	77
CE	Refinement of Current Disposal Criteria, Identification of Subject Areas for Further Development, and Refinement of Bioassay Procedures	University of Texas at Dallas	144	77
EPA	Simplification of Koh-Chang Model	JBF Scientific Corp.	46	77
EPA	The Dispersion and Fate of Hazardous Materials in Large Lakes	Case Western Reserve Univ.	350	78
		Fill Material		
CE	Assessment of the Types and Quantities of Fill Material and the Impacts of Their Disposal	University of Oklahoma	91	77

PART VII: RESEARCH PRIORITIES - IMMEDIATE NEEDS FOR IMPLEMENTATION MANUAL

The research programs recommended by the Technical Committee for immediate implementation are listed by appropriate subcommittee. Within each subcommittee listing, the research is shown in priority order. The overall priority as presented in Part V is also shown in parentheses following each title.

Bioassay/Bioevaluation Subcommittee

Benthic organism bioassay (1)

Objective. To develop a technically sound bioassay procedure for evaluating the long-term effects of the deposition of contaminated sediment on or near macrobenthic infauna and epifauna.

Problem statement. Perhaps the single largest unanswered concern about dredged material disposal is the effect over time on animals living in or on the deposited material. This seems the situation with the greatest potential for adverse impacts, if such impacts occur at all. Thus, regulatory personnel need a method to predict beforehand the consequences of long-term exposure to deposits of the dredged material in question.

Approach. Initial research is underway at WES and EPA on the nature of possible effects of long exposure to contaminated sediments, appropriate laboratory exposure techniques, organisms suitable for such testing, etc. Effects being studied include mortality, uptake of contaminants, important sublethal stresses on the organisms, and effects in marketability of commercial species.

Resource needs and project duration. No funds besides the approximately $310,000 already committed by the two agencies will be required to complete these ongoing projects by October 1977.

Water column bioassay (8)

Objective. To develop bioassay methods appropriate to evaluating

the impacts of soluble or suspended phase of dredged material on organisms in the water column.

Problem statement. The only release of contaminants from dredged material clearly demonstrated to date occurs immediately after disposal. The effect of any released contaminants on organisms living in the water column must be predicted before the likely environmental impact of aquatic disposal can be assessed.

Approach. This need will be met by currently available information and the ongoing WES research on the biological assessment of the elutriate test and development of a time-dilution bioassay technique. The biological assessment of the elutriate will also provide a standard zooplankton bioassay for inclusion in the CE Interim Guidance on the Implementation of Section 404(b)(1) of PL 92-500.

Resource needs and project duration. No funding required beyond existing commitments. Completion by June 1977.

Area Definitions Subcommittee

Wetlands vegetation identification guide and transition zone characterization (3)

Objectives.

- Determine plant species composition of transition zones around wetlands.
- Establish dominant indicator species and plant densities within transition zones.
- Provide alternative rating schemes for determining jurisdictional boundaries based on plant community associations.

Problem statement. Wetland communities usually exist contiguous to more mesic types of communities. The integrading zone between the two types of communities is termed a "transition zone." This zone usually supports plant species that are indicative of both communities. Therefore, these zones are usually more variable in species composition and are less distinct in vegetational community characterization than either wet or mesic communities. These zones are important to the Section 404 permit program in that they are poorly defined and are

likely to be the areas most contested as to their identify as wetlands or nonwetlands. Criteria are needed to describe and to determine the extent of transition zones around each type of wetland that occurs within the United States.

Approach. Examples of each type of wetland community that occurs within a region of the country will be selected for study. Transition zones around these communities will be thoroughly characterized according to species composition and community structure. From these data, sets of criteria will be established to describe areas of the transition zones that are 100 percent, 70-80 percent, 40-60 percent, 20-30 percent, and 0 percent in wetland plant species composition. Each set of criteria will be accompanied with information on the trade-offs and degrees of wetland protection that would be afforded under each for final decision-making.

In order to develop these criteria within a period that will be timely for application to the Section 404 permit program, it has been proposed that the CE and EPA (Corvallis Environmental Research Laboratory) share the responsibility for the various regions of the country as follows:

Responsibility		Funding Requirements, $K FY 77	FY 78
CE:	Gulf Coast	52	13
	Florida-Puerto Rico	32	8
	North Atlantic Coast	40	11
	Hawaii-Pacific Islands	70	20
EPA:	Pacific Northwest	-	-
	California	-	-
	Alaska	100	50
	Central Atlantic Coast	10	-
Joint CE/EPA:			
	South Atlantic Coast	20	6
	Interior-Great Lakes	55	6
	TOTAL	379	114

A substantial part of the work in the areas of EPA responsibility was initiated in late FY 76T. The individual funding levels are listed in Part VI.

Resource needs and project duration. In order to complete the work initiated by the EPA and to initiate work in the areas of WES responsibility, new funding requirements during FY 77 and FY 78 are shown in the above tabulation.

Headwaters definition (6)

Objective. Develop practical methodologies for use by CE and/or other agencies and individuals in defining the "headwaters" of interstate waters and intrastate lakes, rivers, and streams as related to the extent of jurisdiction of Phase III, Section 404, PL 92-500.

Problem statement. As it will pertain to defining the extent of Phase III of the Corps' function of issuing permits for activities in navigable waters, the term "headwaters" (Federal Register, Vol. 40, No. 144, Part IV, 25 July 1975) is defined as the point on a stream beyond which the flow of the water body is normally less than 5 cfs. Since a "normal" flow of 5 cfs is not a recognized or standardized measure of stream discharge that can be ascertained from available hydrologic data, a uniform methodology or methodologies are needed whereby this point can be identified in nature, preferably one(s) not requiring field investigations or measurements. The methodologies should be available for Corps-wide use prior to the initiation of Phase III jurisdiction on 1 July 1977.

Approach. The 5-cfs definition of headwaters is arbitrary in that it is not a naturally occurring phenomenon easily recognized or measured in the field. A practical approach appears to be one that would rely on drainage basin runoff characteristics and that could be used in association with regional maps for a one-time determination of jurisdictional limits; other approaches need to be considered and tested under differing physiographic conditions.

Resource needs and project duration. Provided that Congress does not pass legislation or the Corps does not take administrative action to delay implementation of Phase III, a workable methodology will be needed not later than 1 July 1977. It is estimated that this goal can be achieved prior to 1 July at a cost of $100,000.

Contaminants Subcommittee

Sampling, analytical, and interpretative manual (2)

Objectives. Provide regulatory agencies with a state-of-the-art manual for sampling, characterization, and methods of analysis to include quality assurance programs and represent areas relating to contaminants found in dredged and fill material and water quality assessments for aquatic disposal and containment area effluent or runoff. Further goals are to provide interpretive guidance concerning implementation of results of sampling, characterization, and analytical methods and to identify areas where present information or procedures are incomplete or inadequate and recommend necessary research to eliminate these limitations.

Problem statement. To develop and implement criteria providing meaningful information, a comprehensive manual is needed for sampling, characterization, analytical methods, and interpretive guidance for proposed dredged and fill material discharges. An operations manual is required to ensure consistency in the planning and implementation of sampling and analytical programs, establish adequate quality control programs, and aid in the development of a uniform data base. There is need to evaluate, modify, and, where necessary, develop chemical techniques that can be used routinely by standard testing laboratories.

Approach. Guidelines on sampling equipment, procedures, patterns, and frequency and number of samples will be developed. These topics will be considered in view of the purpose of the individual sampling program, type of dredge or fill operation, and the environment in which the sampling is conducted. Areas of special interest will include sampling, characterization, preservation, and handling techniques and quality control procedures pertinent to the chemical parameters of interest and to the process or procedure by which the results are interpreted. The number and location of samples at a specific site must be adequate to reflect site heterogeneity.

Intrinsic to the manual is development of an analytical chemistry

section that gives techniques for sample preparation and analysis with emphasis given to parameters of interest, interference matrices, laboratory preservation, sample integrity, analytical sensitivities, reliability for the various standard methods, and average laboratory turnaround times. Analysis of water (marine and fresh), dredged and fill material leachates, various chemical (acid, alkaline, organic, and exchange) extracts of dredged or fill material, gaseous phases of dredged or fill material, and biological samples should be included. Analytical procedures for both gross and trace concentrations of specific inorganic and organic parameters and evaluation of manual and automated procedures will be included.

The manual will also include instructions for pertinent physical analyses such as particle-size distribution and mineralogical characterizations. Interpretive guidance must be developed to aid environmental managers in judicious selection of variables, properties, and procedures that best characterize a given situation.

Selection of a specific or individual evaluative technique should be directly related to the geographic environment, interference difficulties, and the purpose for which the results are to be used. Further consideration must be given to selection of groups of parameters and characterization techniques in relation to the need for the analyses and the usefulness of these procedures. Development of this interpretative guidance should rely heavily on current and completed DMRP laboratory and field investigations as well as past experience in implementing regulatory criteria at the CE District and EPA Region levels.

The manual should be formulated such that it can be updated periodically as information is forthcoming from current applicable research.

Resource needs and project duration. The project funding level for FY 77 and FY 78 is estimated to be $250,000 each fiscal year. Manual development would require a two-year time frame, during which time the interim and final manual would be published.

Physical Impact Subcommittee

Methodologies are now available to predict general physical changes

caused by discharge of dredged and fill material. Relatively fewer methods are available to adequately describe and predict biological and chemical effects. Because of this, it is felt that the refinement of physical impact tests will be of little value in assessing the total problem until significant advances in procedures for evaluating biological and chemical effects are made. Therefore, results of immediate research on physical impact methodologies are not indicated for inclusion in the Implementation Manual.

Mixing Zone Subcommittee

Improved mixing zone guidance (4)

Objective. Provide improved guidance for use by field offices of the CE and EPA in implementing the mixing zone concept.

Problem statement. A mixing zone may be defined as an area or volume of water contiguous to a disposal operation where exceptions to water quality standards and conditions otherwise applicable to the receiving waterbody may be granted. Effective use of the mixing zone concept requires realistic guidance in two major areas. First, a reasonable procedure is needed to predict the shape and size of the discharge plume for different disposal techniques and disposal environments. Second, rational narrative guidance is needed to assist in the evaluation of the acceptability of the mixing zone associated with specific disposal operations. Although some interim information has been distributed in these areas, improved guidance is needed in both areas.

Approach. An interim procedure for estimating discharge plume shapes and sizes and thus mixing zones was included in the recently distributed Interim Guidance for 404 criteria.* The Mixing Zone Subcommittee is currently drafting a manual that will include this procedure and substantial narrative guidance concerning factors to be considered and evaluating the acceptability of predicted mixing zones. It is anticipated that an interim version of this manual will be completed and

*Ibid.

distributed to field offices prior to completion of the Implementation Manual. Results of all current research related to mixing zones and field office experience will be analyzed and synthesized with the intent of improving and updating information in the subcommittee report prior to submission of mixing zone guidance for inclusion in the Implementation Manual.

Resource needs and project duration. This work will be accomplished by members of the Mixing Zone Subcommittee over the next few months. It is estimated that CE subcommittee members will devote a total of about six man-months of effort to this task from the DMRP at a total cost of $30,000.

Fill Material Subcommittee

Fill material assessment: types and quantities (5)

Objective. Ascertain the scope of the fill material discharge regulation.

Problem statement. In order to more properly regulate the discharge of fill material as time passes, a clearer understanding of the nature of the material will be required. Unfortunately, almost any substance could be used as a fill material, and the cost of an in-depth study of even a fraction of the potential substances that could constitute a fill material would be prohibitive. Thus, a high priority must be set upon determining those types of materials that would constitute a significant source of fill material and the potential biological, chemical, and physical impacts associated with their discharge.

Approach. A rigorous analysis of all pertinent literature related to the discharge of fill material falling under the jurisdiction of PL 92-500 will be conducted. The most pressing problems as seen by CE field offices in the regulations of fill material will also be evaluated in terms of knowledge gaps. A prioritized list will be prepared of areas where a significant lack of knowledge exists concerning the environmental impact of a fill material discharge.

Resource needs and project duration. The University of Oklahoma is under contract to the WES to conduct this study from July 1976 to March 1977 at a cost of $91,000.

Survey of present methodologies (7)

Objective. Determine existing chemical, physical, and biological procedures that could be useful in the pre-discharge evaluation of fill material.

Problem statement. At least the following questions will have to be answered to evaluate the impact of various categories of fill material originating on land.

1. How does the physical nature of the fill material affect contaminant mobility and how can it be quantified for determination of the ultimate pollution load?
2. How do the biological and chemical natures of the fill material affect contaminant mobility and how can they be quantified for determination of the ultimate pollution load?
3. How do the physical conditions (tides, rainfall, temperature, salinity, etc.) at the disposal site affect mobility and how can they be quantified for determination of the ultimate pollution load?
4. How are the various quantified properties of the fill material and site evaluated to determine an impact factor for a particular discharge operation?

Approach. Methods of quantitatively assessing the actual impact of a fill material discharged into a navigable waterway or contiguous wetland must be surveyed. A general cataloging of potential methods should be made before the results of the fill material assessment study are complete. The development of tentative procedures for fill material evaluation could be pursued more vigorously at the conclusion of the assessment study. Tentative methods for evaluation of major types of fill material should be adopted and used until research efforts produced more definitive procedures.

Resource needs and project duration. It is estimated that $100,000 and nine months would be required for this study.

PART VIII: LONGER TERM RESEARCH PRIORITIES

This part of the report describes the longer term research programs that need to be continued or immediately initiated for a more complete understanding of ecological perturbation and mitigation of adverse impacts. The programs are listed by appropriate subcommittees; within each subcommittee listing, the research is shown in priority order.

Bioassay/Bioevaluation Subcommittee

Benthic organism bioassay development (1)

Objective. Refine and adapt benthic bioassay and body burden techniques to match various dredging methods and sediment types and regionally important organisms.

Problem statement. The ongoing WES and EPA benthic bioassay projects will develop first-generation procedures for assessing the long-term impacts of disposal on benthic organisms. These will need to be refined and expanded to suit different disposal situations and to increase sensitivity and accuracy as predictive tools. The concept of using body burden of selected heavy metals in benthic organisms as a screening procedure for indicating potential effects of aquatic disposal of contaminated material will be investigated as part of the benthic bioassay.

Approach. The benthic bioassay refinement will involve further development in terms of modified exposure methods to suit various dredging and disposal techniques, determination of regionally appropriate test species, sublethal parameters to be measured, minimum length of tests necessary to determine effects, etc. The possibility of finding some fairly rapidly attainable end point that correlates with, and adequately predicts, longer term effects will be investigated.

Research on the use of body burdens of selected heavy metals in benthic organisms as a screening procedure will include literature review and evaluation; the relative importance of contaminant accumulation directly from waterborne sources versus direct or indirect

accumulation from the sediments; how accumulation from the sediments is influenced by dredging; determination of appropriate species; applicability if the same species cannot be found at the dredging and disposal sites or if the salinity is markedly different at the two sites; substances to be analyzed for; and biological significance of a particular body burden.

Resource needs and project duration. $1,300,000 and three years will be needed for this study.

Area Definitions Subcommittee

The subcommittee is of the opinion that the highest priority longer term research needs relate to methodologies for determining the relative values or worth of various wetland types and methodologies for predicting the cumulative effects of multiple permitted activities in wetlands. Exploratory and preliminary efforts are now in progress and until their results are known, detailed statements of objectives and approaches would be premature. It is expected that these statements can be prepared during the next 6 to 12 months.

Contaminants Subcommittee

Short- and Long-Term Sediment/Water Interactions (3)

Objective. It is not enough to state that a given sediment may or may not be polluted because it contains certain chemicals or responds in a particular way to a biotoxicity evaluation. In order to more fully understand the biological-chemical-physical interactions, efforts need to be expended in studying the mechanisms and kinetics of these interactions.

Problem statement. To better understand what materials are impacting the ecosystem, a detailed understanding of the mechanisms and kinetics of adsorption and desorption on/from particulate matter is mandatory. The toxicity of metals has been correlated with the form in

which they exist in nature. Speciation will have an effect on availability, toxicity, and adsorption/desorption phenomena. The determination of the speciation changes is needed. The kinetics and mechanisms of metals mobility in sediment as affected by organometal exchange as well as alkylation of some metals also need to be investigated.

In addition to the above mechanistic questions, there is a need for a chemical characterization procedure for dredged and fill material that can be used to predict or estimate long- or intermediate-term release of constituents and can be used to chemically evaluate long-term benthic biotoxicity tests.

Approach. These problems involve determining rate constants, exchange coefficients, analytical methods, etc.

With the complete picture of what happens and how or why it happens, the task of predicting and thereby preventing environmentally undesirable interactions will be a more reasonable undertaking.

Resource needs and project duration. It is projected that a minimum of five years and a minimum of $175,000 per year will be required to properly address these questions.

Physical Impact Subcommittee

Methods to predict material distribution from wetland dredge/fill and effects of of topography and elevation changes on wetlands, drainage, and circulation (5)

Objective. Development of methods to predict the extent and depth of coverage resulting from dredged material disposal or filling operations. Methods to predict resulting composition of the sediment and its spatial and temporal distribution will be developed. Methods to determine how the above-changed topography and elevations will affect drainage and circulation will also be included.

Problem statement. To better understand the physical impact of dredged and/or fill material disposal operations, it is necessary to be able to predict the ultimate distribution of the material after disposal as well as its effect on the existing topography and circulation

patterns in the disposal area. Since most of the data gathered to date have been concerned with dredged material disposal, primary emphasis of this research should focus on those aspects dealing with fill material. The methods for measuring these physical parameters related to dredged or fill material disposal are available and could easily be implemented to develop a capability for predicting physical impact.

Approach. Based on information already produced by the DMRP and other research efforts, field studies must be implemented to determine the relationship between the operational aspects of dredged or fill material disposal and factors such as the 3-dimensional distribution of the dredge/fill material and its geotechnical properties. It will also be necessary to determine how these distributions change as a function of time and the effects of these changes on the elevation, drainage, and circulation at the disposal site. This field data can then be incorporated into mathematical models to predict the ultimate distribution of dredged or fill material based on the nature of the proposed dredge or fill operation and the laboratory characterization of the dredged or fill material.

Resource needs and project duration. Approximately $1 million over four years.

Methods to predict how changing bottom topography and depth from dredge or fill operations alter circulation (7)

Objective. Development of methods to predict the extent and depth of coverage resulting from open-water dredged material disposal or filling operations. Methods to predict changes and nature of surface sediment will be developed. Also, methods will be developed to predict how changing bottom topography and depth alter circulation.

Problem statement. Since the physical impact of dredged or fill material disposal operations is intrinsically related to the extent and depth of material coverage, it is necessary to be able to predict these latter parameters as they relate to the disposal operation and the material characteristics before the effects of the disposal operations

on circulation patterns in the vicinity of the disposal operation can be assessed. Based on a prediction of these physical parameters, the direct and indirect biological and chemical effects can then be considered. The short-term fate of dredged material has been evaluated to some extent; the characterization and evaluation of fill material dispersion has not.

Approach. Although recent DMRP research concerned with open-water disposal of dredged material has yielded a great deal of information about the short-term fate of dredged material, additional field studies should focus primarily on the fate of fill material disposed in open water. Additional field research on both dredged and fill material disposal should include the measurement of the 3-dimensional distribution of the material, its characteristics as a function of its distribution after disposal, as well as changes in the size, shape, and character of the disposed material deposit as a function of time and the hydrodynamic regime present at the disposal site. Supplementary mathematical modeling efforts can then be directed at developing a capability for predicting the relationship between changes in bottom topography/depth and the circulation patterns in the vicinity of the disposed material.

Resource needs and project duration. Approximately $1,300,000 over six years.

Mixing Zone Subcommittee

Predictive models for determining the short-term physical fate of disposed materials (2)

Objective. Development of improved models for predicting the short-term physical fate of dredged material discharged into open water.

Problem statement. An integral part of the problem of assessing the environmental impact of an open-water disposal operation is the ability to determine the spatial and temporal distribution of the dredged material following its discharge into the water. By contract with Tetra Tech, Inc., two models (one for instantaneous dumped

discharge and one for fixed or moving jet discharge) have been developed to address this need. These models are currently being evaluated using the limited field data that can be developed from DMRP field studies and other sources. While the models are considered conceptually sound, it is anticipated that the verification studies will suggest needed improvements or simplification to the models and/or better definition of key empirical coefficients.

Approach. No specific approach can be specified until results of the verification studies become available (about September 1977) to permit definition of the needed improvements.

Resource needs and project duration. It is anticipated that this work would be done under contract by one group (CE, EPA, or private contractor). Tentative estimates for planning purposes would be about one year and $100,000.

Evaluation and field verification of state-of-the-art predictive models of sediment dispersion and transport (6)

Objective. Development of an improved capability for predicting the longer term distribution of dredged material deposited at a given disposal site.

Problem statement. The longer term stability or movement of dredged material deposited in a disposal site is of interest because of its environmental implications and because of its potential for influencing dredging requirements. By contract with Dr. Ray Krone and associates at the University of California, Davis, mathematical models were developed for cohesive sediment transport in the estuarine environment. These models, which must be used in conjunction with hydrodynamic models, are based on descriptions of transport processes such as aggregation, deposition, and erosion developed from extensive laboratory and field studies during recent years. However, very limited data have been available for model verification and evaluation. Significant additional evaluation and field verification of these models is needed to establish their predictive capability.

Approach. An initial effort designed to familiarize CE personnel with the details of the models, to conduct additional sensitivity and operational tests of the models, and to develop improved documentation of the models and their potential uses is tentatively planned within the life of the DMRP. Only limited field information will be available to guide this preliminary evaluation of the models. More meaningful evaluation of the predictive capabilities of the models must await the availability of a more extensive set of field data.

Collection of the needed field data will be an expensive operation. An approach that warrants consideration is to tie the need for good verification data to a specific project study where much of the needed data would be collected for project requirements (e.g., field data-collection program to provide verification data for shoaling studies in a physical estuary model). In this way money provided for this task could be used to supplement project funds, permitting the collection of a comprehensive set of hydrodynamic and sediment transport data.

It would be difficult to overemphasize the importance of having one good set of field data to establish an indication of model capabilities and limitations. It is extremely important to take these models to at least that point with general funding before assuming that the evolutionary process of model improvement will be underwritten by project-related studies.

Resource needs and project duration. The initial model evaluation project is planned as a cooperative effort between CE personnel and the model developers. This task will require about one year with a total cost of about $100,000 with these funds tentatively scheduled to be provided from CE FY 77 research funds. It is difficult to estimate time and funding requirements for the longer range task of field verification, but a reasonable planning estimate is two years and about $300,000.

Fill Material Subcommittee

Procedures to evaluate and quantify the mobility of contaminants from fill material (4)

Objectives. Develop procedures that can be used to determine

reliably the impact of fill material on a navigable waterway or contiguous wetland before the fill is discharged.

Problem statement. The problem is as stated in Part IV under the purpose of the Fill Material Subcommittee. However, in this case, new methods will have to be developed for the long-term solution of the evaluation procedure.

Approach. Chemical, physical, and biological procedures will have to be developed by modification of existing methods or completely new approaches to the simulation of a fill operation. Information on sample size, sample preservation, extractants, and methods of contaminant detection will have to be determined for each major class of fill material. The important factors are, however, that the developed procedures simulate in a quantitative manner the factors that will affect the release of contaminants and that this release can be assessed by mathematical models or simple correlations to allow a rational decision to be made on a particular fill operation.

Resource needs and project duration. If the scope of fill material discharge regulation is in fact as extensive as it appears to be, $3 to $6 million and four years will be required to develop the needed methods.

A final decision tree for the Implementation Manual (8)

Objective. Development of a decision tree that presents a logical sequence for the evaluation of fill material.

Problem statement. In order to efficiently evaluate a proposed discharge operation, questions need to be addressed in an orderly fashion from the broadest to the most site specific. In addition, the right questions and methodologies for the evaluation of a particular fill material discharge into a particular site need to be selected. A logic sequence, probably computerized, needs to be developed.

Approach. The procedure as outlined in the interim implementation manual will be expanded into a logic format somewhat similar to a taxonomic key. The procedures referenced at a particular step will be contained in appendixes. The contractor who develops the logic sequence

will be responsible for ensuring that it corresponds with the guidance of Section 404 of PL 92-500.

Resource needs and project duration. One year and $200,000 would be required.

APPENDIX A: AUTHORIZING CORRESPONDENCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

0 8 OCT 1975

OFFICE OF
RESEARCH AND DEVELOPMENT

Mr. William B. Taylor
Chief, Research and
Development Office (DAEN-RDZ-A)
Department of the Army
Washington, D.C. 20314

Dear Mr. Taylor:

As you are aware, members of my staff have been working very closely with Dr. John Harrison and other personnel of the Waterways Experiment Station (WES) on developing the ecological evaluation procedures for the Section 404 Guidelines as required by P.L. 92-500.

I have been informed by Dr. Paul Lefcourt of my staff, that in the course of the Environmental Protection Agency-U.S. Army Corp of Engineers (EPA-COE) Section 404 effort, it became evident that there is a need to coordinate EPA's research activities with those of the dredge material research program being conducted at WES. Coordination is needed between our research organizations to: (1) enhance our dredge material ecological research activities of mutual interest (developing joint projects, avoiding duplication of effort, exchanging research information, etc.); (2) provide technical guidance for subsequent revisions of the Guidelines as required under Section 404 of P.L. 92-500 and Section 102 of P.L. 92-532; (3) mutually develop both a short term interim methods manual; and (4) a longer term methods manual.

One organizational approach to coordinating our research activities is to set up an interagency executive committee consisting of program managers and/or laboratory directors who have broad knowledge and responsibilities for research programs under their control. This committee would have overall responsibility for implementing the four objectives given above. I imagine the committee would meet 2-3 times per year and would be charged with planning and coordinating EPA and COE research activities for

both Section 404 of P. L. 92-500 and the ocean disposal effort covered by P. L. 92-532. It is likely that the committee may wish to appoint ad hoc working groups to develop the coordination products such as the methods manuals, bioassay procedures or recommendations for changing the Guidelines and Criteria.

If you agree to the formation of such an interagency committee, I would appoint the following personnel or their designees from EPA's Office of Research and Development:

1. Dr. Paul Lefcourt, Office of Health and Ecological Effects, Headquarters

2. Mr. Dwight Ballinger, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio

3. Dr. Eric Schneider, Director, Environmental Research Laboratory (ERL), Narragansett, Rhode Island

4. Dr. Thomas Duke, Director, ERL, Gulf Breeze, Florida

5. Dr. A. F. Bartsch, Director, ERL, Corvallis, Oregon

6. Dr. Donald Mount, Director, ERL, Duluth, Minnesota

I envision the committee would have joint EPA-COE chairmanship and would develop its terms of reference within the broad guidance given in this letter at its first meeting. In addition, at the first meeting, planning for its first year activities would be discussed and agreed to. Because the development of the interim methods manual is urgently needed, I suggest that the first committee meeting be held on October 16 and 17, 1975, at the WES facility at Vicksburg, Mississippi. The two days should provide adequate time to complete the business of the organizational meeting and review the WES Dredge Material Research Program in depth. I hope you agree that the formation of such a Committee is necessary. Dr. Paul Lefcourt of my staff will assist members of

your staff in working out the details and arrangements in preparation for this meeting. Dr. Lefcourt can be reached on 202-755-0433.

I am looking forward to your early reply.

Sincerely yours,

W K Talley

Wilson K. Talley
Assistant Administrator
for Research and Development

cc: Dr. Lefcourt
Mr. Ballinger
Dr. Schneider
Dr. Duke
Dr. Bartsch
Dr. Mount
Dr. McErlean
Dr. Albert

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314

REPLY TO
ATTENTION OF:

DAEN-RDZ-A

14 November 1975

Dr. Wilson K. Talley
Assistant Administrator for Research and Development
United States Environmental Protection Agency
Washington, D.C. 20460

Dear Dr. Talley:

I agree completely with the need for the Environmental Protection Agency/Corps of Engineers (EPA/CE) Technical Committee for Coordinating Research Efforts Relevant to the Guidelines Required Pursuant to Section 404 (PL 92-500) and Section 103 (PL 92-532) described in your letter of 8 October 1975. As you know, an organizational meeting was held at the Waterways Experiment Station (WES) on 16-17 October 1975. For your convenience the minutes of that meeting and list of attendees are at Inclosures 1 and 2, respectively. I concur with the agreements reached at the WES meeting with respect to both committee function and the participation of the designated WES personnel.

I understand since this meeting that Dr. Don Phelps has been designated as the EPA representative of the Narragansett Environmental Research Laboratory and Mr. Dwight Ballinger or his alternate will represent the Environmental Monitoring and Support Laboratory in Cincinnati, Ohio. I am sure you agree that our joint designation of individuals by name to serve on this committee is a key element to the success of this endeavor. I consider it of equal importance that these designated individuals be allowed to devote the time necessary to ensure technically meaningful evaluative procedures for Sections 103 and 404. To this end, I can assure you that the WES personnel assigned to this committee consider this a high priority assignment.

I believe our agencies have taken a step forward with the formation of this committee. I feel certain that the interaction of our technical staffs working toward the common goal of providing state-of-the-art techniques for evaluating the environmental consequences of the discharge of dredged and fill material will be of great benefit to the Nation.

Sincerely yours,

WILLIAM B. TAYLOR
Chief
Research and Development Office

2 Incl
as stated

APPENDIX B: SUBCOMMITTEE MEMBERSHIP

BIOASSAY/BIOEVALUATION SUBCOMMITTEE

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